6.3.1 EQUIPMENT AND SUPPLIES

The instrument system used to measure conductivity must be tested before each field trip and cleaned soon after use. Every conductivity instrument must have a log book in which repairs and calibrations are recorded, along with manufacturer make and model description and serial or property number.

Table 6.3–1. Equipment and supplies used for measuring conductivity[1]

[°C, degrees Celsius; L, liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius]

- ✓ Conductivity instrument and conductivity sensor
  - Battery powered Wheatstone bridge
  - Direct readout
  - Temperature range at least –5 to +45°C
  - Temperature compensating (25°C)
  - Accuracy: Conductivity ≤100 µS/cm, within 5 percent of full scale
    Conductivity >100 µS/cm, within 3 percent of full scale
- ✓ Thermistor thermometer sensor (for automatic temperature-compensating models)
- ✓ Thermometer, liquid-in-glass or thermistor
- ✓ Extra sens[illegible] ries, or backup instrument
- ✓ Conductivi[illegible] ities that approximate and bracket field values
- ✓ Compositir[illegible] r surface-water samples
- ✓ Flowthrou[illegible] instrument for ground-water measurements
- ✓ Plastic beakers (assorted sizes)
- ✓ Soap solution, nonphosphate (1 L)
- ✓ Hydrochloric acid solution, 5 percent volume-to-volume (1 L)
- ✓ Deionized water, 1 L, maximum conductivity of 1 µS/cm
- ✓ Paper tissues, disposable, soft, and lint free
- ✓ Brush (small, soft)
- ✓ Waste disposal container
- ✓ Minnow bucket with tether (or equivalent) for equilibrating buffer solutions to sample temperature
- ✓ Instrument log book for recording calibrations, maintenance, and repairs

[1]Modify this list to meet the specific needs of the field effort.

- Many conductivity instruments are available; the specifications and instructions provided here are general. Users must be familiar with the instructions provided by the manufacturer.

- Conductivity sensors are either contacting-type sensors with electrodes or electrodeless-type sensors.
  - **Contacting-type sensors with electrodes.** Three types of cells are available: (1) a dip cell that can be suspended in the sample, (2) a cup cell that contains the sample, or (3) a flow cell that is connected to a fluid line. Choose a cell constant on the basis of expected conductivity (table 6.3–2). The greater the cell constant, the greater the conductivity that can be measured. The cell constant is the distance between electrodes (in centimeters) divided by the effective cross-sectional area of the conducting path (in square centimeters).
  - **Electrodeless-type sensors.** These operate by inducing an alternating current in a closed loop of solution, and they measure the magnitude of the current. Electrodeless sensors avoid errors caused by electrode polarization or electrode fouling.

Quality-controlled conductivity standards ranging from 50 to 50,000 µS/cm at 25°C can be obtained from QWSU. Prepare standards outside this range or order them from suppliers of chemical reagents. Conductivity standards usually consist of potassium chloride dissolved in reagent-grade water.

Table 6.3–2. Example of cell constants for contacting-type sensors with electrodes and corresponding conductivity ranges

Conductivity range, in microsiemens per centimeter	Cell constant, in 1/centimeter
0.005–20	0.01
1–200	.1
10–2,000	1.0
100–20,000	10.0
1,000–200,000	50.0

6.3.1.A MAINTENANCE, CLEANING, AND STORAGE

As soon as possible after delivery to the office, label conductivity standards with the date of expiration. Discard standards that have expired, been frozen, have begun to evaporate, or that were decanted from the storage container.

Maintenance

Maintenance of conductivity equipment includes periodic office checks of instrument operation. To help keep equipment in good operating condition:

- Protect the conductivity system from dust and excessive heat and cold.
- Keep all cable connectors dry and free of dirt and extraneous matter.
- Protect connector ends in a clean plastic bag when not in use.

Sensor cleaning

Conductivity sensors must be clean to produce accurate results; residues from previous samples can coat surfaces of sensors and cause erroneous readings.

- Clean sensors thoroughly with deionized water (DIW) before and after making a measurement (this is sufficient cleaning in most cases).
- Remove oily residue or other chemical residues (salts) with a detergent solution. Sensors can soak in detergent solution for many hours without damage.
- If oil or other residues persist, dip the sensor in a dilute hydrochloric acid solution. **Never leave the sensor in contact with acid solution for more than a few minutes.** Check the manufacturer's recommendations before using acid solution on sensors.
- Clean carbon and stainless steel sensors with a soft brush. Never use a brush on platinum-coated sensors.

Sensor storage

Refer to the manufacturer's recommendations.

- Sensors may be temporarily stored in deionized water between measurements and when the system is in daily use.
- For long-term storage, store sensors clean and dry.

CAUTION: Before handling conductivity standards or acids, refer to Material Safety Data Sheets (MSDS) for safety precautions.

Some of the procedures recommended herein for equipment operation may be out of date if the equipment being used is different from that described or incorporates more recent technological advances—follow the manufacturer's instructions.